Dynamic Positioning of Drilling Vessels with a Fuzzy Logic Controller

Authors: Yusong Cao, *Stress Engineering Services, Inc. (Houston, TX, USA);* Tzung-hang Lee, *Tamkang University (Tamsui, Taiwan, R.O.C);* David L Garrett and John F Chappell, *Stress Engineering Services, Inc. (Houston, TX, USA)*

Abstract

This paper discusses a fuzzy logic controller for dynamic positioning of drilling vessels in deep water. The core of the fuzzy controller is a set of fuzzy associative memory (FAM) rules that correlate each group of fuzzy control input sets to a fuzzy control output set. A FAM rule is a logical if-then type statement based on one's sense of realism and experience or can be provided by an expert operator. The design of the fuzzy controller is very simple and does not require mathematical modeling of the complicated nonlinear system based on first principles. The fuzzy controller uses measured vessel heading, yaw rate, distance and velocity of the vessel relative to the desired position (location and heading) to generate the control outputs to bring the vessel to and maintain it in the desired position. The control outputs include the rudder angle, propeller thrust and lateral bow thrust. The effectiveness and robustness of the fuzzy controller are demonstrated through numerical time-domain simulations of the dynamic positioning of a drill ship of Mariner Class hull with use of nonlinear ship equations of motions.

Click here to review the complete paper ➤

Click here to return to the session directory ➤